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Awareness about N6-Carbamoylmethyladenine among Allied Health Science Students

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Introduction: N6-methyladenosine (m6A) is the most abundant form of mRNA modification in eukaryotes. It affects various aspects of RNA metabolism, including nuclear export, translation, decay and alternative splicing. Among the diverse layers of epigenetic regulation, modifications of DNA and proteins have been explored in depth; however, RNA modification is a relatively new field. Aim: This survey was conducted for assessing the awareness about medicinal application of N6- carbamoylmethyladenineamongst allied health science students. Materials and Methods: This cross-sectional research was conducted with a self-administered questionnaire containing ten questions distributed amongst 100 Allied Health science students.The questionnaire assessed the awareness about N6- carbamoylmethyladenine, their antioxidant properties, antibacterial properties applications, anti-neuro degenerative properties applications,enzyme mimicking properties and biosensing properties. The responses were recorded and analysed. Result: 86.9% were aware of N6 - carbamoylmethyladenine. 81.1% know about enzyme methyltransferase. 79.4% are aware of the location of N6- carbamoylmethyladenine. 75.5% are aware about the epigenetic mechanism. 71.4% are aware about RNA methylation. Conclusion: There is moderate awareness amongst allied health sciences students about the N6 - carbamoylmethyladenine. Enhanced awareness initiatives and allied health sciences educational programmes together with increased importance for curriculum improvements that will further help to promote knowledge and awareness of N6 - carbamoylmethyladenine among the students.

Keywords: Awareness, modification, alternate splicing, nuclear export.

1. Introduction

DNA methylation is an epigenetic mechanism involved in many biological functions in prokaryotes and eukaryotes.N6-methyladenosine (m6A) is the most abundant form of mRNA modification in eukaryotes. It affects various aspects of RNA metabolism, including nuclear export, translation, decay and alternative splicing [1]

Among the diverse layers of epigenetic regulation, modifications of DNA and proteins have been explored in depth; however, RNA modification is a relatively new field . More than 100 post-transcriptional covalent modifications are known.MeRIPseq (or MeRIP-seq) stands for methylated RNA immunoprecipitation sequencing, which is a method for detection of post-transcriptional RNA modifications. It is also called m6A-seq. A variation of the MerIP-seq method was coined by Benjamin Delatte and colleagues in 2016. [2].

DNA methylation studies in mammals and plants have focused on 5mC because of its widespread distribution. 5mC has been shown to participate in genomic imprinting, X-chromosome inactivation, transposon suppression, gene regulation and epigenetic memory maintenance.The evolution process includes genetic alterations that started with prokaryotes and now continues in humans. A distinct difference between prokaryotic chromosomes and eukaryotic chromosomes involves histones.N6- methyladenosinemethyltransferase plays a major role in hypoxic preconditions partially through the interaction with lncRNA H19. [3].

The related signaling pathways it is involved in and the biological roles it plays were not fully described until recently. Meanwhile, with the development of efficient methods of m6A detection and subsequent analysis, increasing biological functions are being elucidated. m6A has been reported to control the fate of modified RNAs at multiple steps, including RNA splicing , mRNA stability, cap-independent translation, and miRNA biogenesis [4].

N6-methyladenosine (m6A), installed onto mRNA by the METTL3/METTL14 methyltransferase complex, is the most prevalent mRNA modification. m6A methylation regulates gene expression by influencing numerous aspects of mRNA metabolism, including pre-mRNA processing, nuclear export, decay, and translation.[5] This survey was conducted for assessing the awareness about medicinal application of N6- carbamoylmethyladenine amongst allied health science students.

2. Material and Methods:

This cross-sectional research was conducted with a self-administered questionnaire containing ten questions distributed amongst 100 Allied Health science students.The students were randomly selected across various disciplines of Allied Health Sciences.Thestudy setting was designated in the university campus.The survey instrument was a questionnaire pre tested and evaluated for validity and reliability concerns.

The questionnaire included five questions eliciting the demographic data through open ended responses and multiple choice questions for the other responses.The study was approved by the Institutional Ethical Committee and informed consent was obtained from the participants. The questionnaire was posted in an online platform and the identity of the respondents were kept confidential.

The questionnaire assessed the awareness about N6- carbamoylmethyladenine ,their antioxidant properties, anti bacterial properties applications,anti neurodegenerative properties applications,enzyme mimicking properties and biosensing properties. The responses were recorded and analysed.

The salient questions are,

1. Are you aware of N6- carbamoylmethyladenine?
2. Are you aware of an enzyme methyltransferase?
3. Do you know where the N6- carbamoylmethyladenine is found?
4. Do you know about the epigenetic mechanism?
5. Do you know about RNA methylation?

3. Result:

86.9% were aware of N6 - carbamoylmethyladenine (fig 1). 81.1% know about enzyme methyltransferase (fig 2). 79.4% are aware of the location of N6- carbamoylmethyladenine (fig 3). 75.5% are aware about the epigenetic mechanism (fig 4). 71.4% are aware about RNA methylation(fig 5).

Fig 1: awareness of N6 - carbamoylmethyladenine

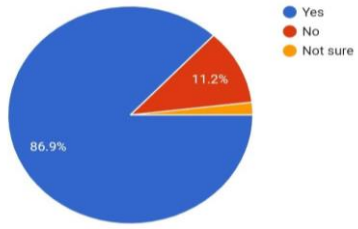


Fig 2: awareness about enzyme methyltransferase

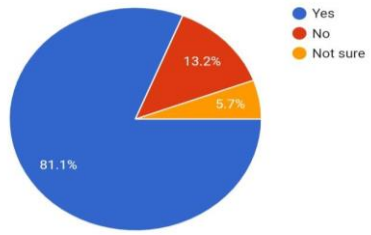


Fig 3 : awareness about the location of N6- carbamoylmethyladenine

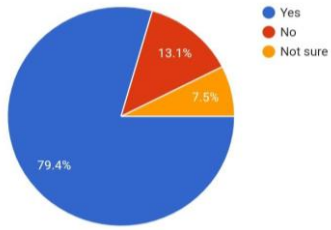


Fig 4: awareness about the epigenetic mechanism

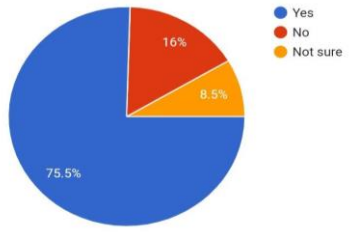
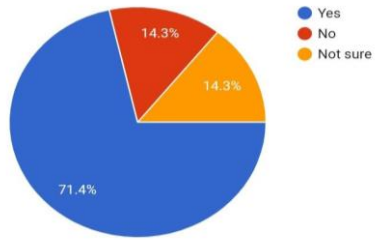


Fig 5: awareness about RNA methylation



4. Discussion:

N6-methyladenosine (m6A) is the most abundant form of mRNA modification in eukaryotes. It affects various aspects of RNA metabolism, including nuclear export, translation, decay and alternative splicing.m6A is the most abundant internal mRNA modification, and it affects various cellular and physiological processes, such as maternal-to-zygotic transition (MZT), cortical neurogenesis, and the regulation of cancer stem cells in acute myeloid leukemia.(6) 86.9% of the participants in this study were aware of N6 - carbamoylmethyladenine.

N6-methyladenosine (m6A) has emerged as an abundant modification throughout the transcriptome with widespread functions in protein-coding and noncoding RNAs. It affects the fates of modified RNAs, including their stability, splicing, and/or translation, and thus plays important roles in post transcriptional regulation.(7)

It is found within some viruses, and most eukaryotes including mammals, insects, plants and

yeast. It is also found in tRNA, rRNA, and small nuclear RNA (snRNA) as well as several long non-coding RNA, such as Xist.(8)

Epigenetics is defined as a mechanism for the stable maintenance of gene expression that involves physically 'marking' DNA or its associated proteins, which allows genotypically identical cells to be phenotypically distinct. Epigenetic marking of the genome can take several forms. Epigenetic mechanisms are defined as mitotically and/or meiotically heritable changes in gene expression that do not involve changes in DNA sequence.(9)

RNA methylation is a reversible post-translational modification to RNA that epigenetically impacts numerous biological processes. It occurs in different RNAs including tRNA, rRNA, mRNA, tmRNA, snRNA, snoRNA, miRNA, and viral RNA.The important role of RNA methylation in promoting UV resistance of cells, and found a new pathway in which METTL3, m6A RNA and "Pol k" play an important role in the early stage of UV induced DDR response, and RNA methylation is crucial for the recruitment of "Pol k" to the damage site.(10-12) There is moderate awareness among allied health science students about the process of RNA methylation, as assessed by this study.

N6-carbamoyl methyladenine (N6-cmA) is a DNA modification that may play a significant role in the development of oral diseases through its influence on gene expression. As an epigenetic marker, N6-cmA can regulate how genes are turned on or off, impacting cellular processes such as growth, differentiation, and responses to environmental factors. In oral tissues, abnormal levels of N6-cmA could contribute to diseases like oral cancers, where it might alter the expression of tumor suppressor genes or oncogenes, leading to uncontrolled cell growth. Similarly, in inflammatory conditions such as periodontitis, N6-cmA might disrupt signaling pathways that regulate inflammation, potentially exacerbating the disease. Additionally, the oral microbiome could influence or be influenced by N6-cmA, affecting the balance between health and disease in the oral cavity. If further research confirms its role in these processes, N6-cmA could become a target for therapeutic interventions aimed at correcting gene expression patterns in oral diseases.(13-17)

5. Conclusion:

There is moderate awareness amongst allied health sciences students about the N6 - carbamoylmethyladenine. Enhanced awareness initiatives and allied health sciences educational programmes together with increased importance for curriculum improvements that will further help to promote knowledge and awareness of N6 - carbamoylmethyladenine among the students.

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